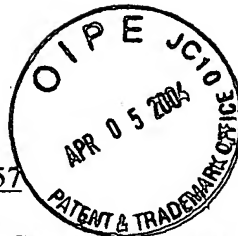


Attorney's Docket No. 033753/269257

PATENT



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Dew, Jr.  
Appl No.: 10/661,349  
Filed: 09/12/2003  
For: HIGH RATE FILTRATION SYSTEM

Confirmation No.:

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

DECLARATION OF GEORGE TCHOBANOGLOUS, PH.D.  
UNDER RULE 132

Sir:

I, George Tchobanoglous, make the following declaration:

1. I am giving this declaration under 37 CFR Section 1.132 in support of the patentability of the invention recited in United States Patent Application Serial No. 10/661,349, filed September 12, 2003. Documents are attached to this declaration as Exhibits A through B in support of the statements made in this declaration. The contents of Exhibits A through B are incorporated in this declaration by reference.

2. I received a BS degree in Civil Engineering from the University of the Pacific, in Stockton, CA, an MS degree in Sanitary Engineering from the University of California, in Berkeley, CA, and a Ph.D. in environmental engineering from Stanford University.

3. I am a professor emeritus from the Department of Civil and Environmental Engineering at the University of California Davis, in Davis, California. I taught at UCD for thirty years and continue to do research in my retirement on filtration and related technologies.

4. In my research, I have studied all types of filtration devices, including depth and surface filters. Patented filters include the Hydro Clear Pulsed-bed filter, the DynaSand continuous up-flow back-wash filter, and the Aqua Aerobic disk filter. I hold a patent on the screening of activated sludge. Further, my work is cited in more than 15 recent patents.

5. I have authored or coauthored 12 textbooks and 3 reference textbooks, as well as more than 350 published articles in the field of environmental engineering. I have served as past president of the American Association of Environmental Engineering and Science Professors and have received the Gordon Maskew Fair and Jack McKee Medals from the Water Environment Federation in recognition of my contributions to teaching and research.

6. I continue to serve as a consultant to private, public, and governmental agencies on a variety of environmental engineering subjects including solid waste management, innovative water and wastewater treatment systems, wastewater filtration, UV disinfection, small wastewater treatment systems, onsite systems, and aquatic treatment systems.

7. I have read the referenced patent application and am fully knowledgeable of its contents, including the pending claims.

8. I have reviewed the Office Action issued in the parent patent application U.S.S.N. 10/098,738, filed March 15, 2002, and the references relied upon by the U.S. Patent Examiner. This declaration presents information demonstrating that the wastewater filtration apparatus and method of the invention provides unexpected and improved results as compared to the prior art apparatus.

9. The apparatus and method of the invention are fundamentally different from the subject matter disclosed in the 1907 Shiltz U.S. Patent No. 847,518 and in Masuda et al. U.S. Patent No. 5,248,415. The Shiltz patent is directed to a multi-media filter of granular material, sand and charcoal, having small layers of compressible fibrous material at each end, and is designed to attach to a city water supply pipe, unlike the apparatus of the invention, which is directed to a filter of compressible media.

10. As illustrated in the Shiltz patent, the filter is attached to an ordinary hand-operated faucet of a type still in use on the exterior of many homes nearly a century later. The filter casing is of a diameter not much larger than the supply pipe to the faucet. The fibrous material is compressed by an upper pressure plate during operation, which is said to increase

filtration efficiency, and is released for cleaning. The upper pressure plate compresses both the top and bottom layers of compressible fibrous material since the charcoal and sand layers in between are not compressible.

11. Shiltz does not disclose 1) that the layers of fibrous material at each end of the granular filter establish a porosity gradient when compressed, or 2) that the filter material is effective to remove suspended particles of smaller and smaller sizes through each successive layer of compressible media, or 3) that a compression gradient can be altered during filtration to extend the filtration time at uniform filtration efficiency, all of which characterize the apparatus and method of the invention.

12. The apparatus and method of the invention is an improvement on the subject matter of the Masuda patent.

13. The Masuda patent discloses a filtration apparatus operated in an upflow mode in which crimped fibrous lump filtration media are compressed in a filter bed defined by a movable lower perforated plate and a fixed upper perforated plate. Wastewater flows upwardly through the lower perforated plate, through the filter bed, and out through the upper perforated plate. Suspended matter is captured by the individual fibrous lumps. The Masuda patent discloses that the lower plate is raised to compress the fibrous lumps to form a dense and uniform filter layer. The lower plate is moved by a rod that passes through the wastewater, the media, and the upper stationary plate, against which the rod is sealed.

14. In the Masuda apparatus, the dense and uniform filter layer that results from compressing the fibrous lumps from the bottom up is counter-productive to the filtration process and in practice causes rapid clogging of the filter bed to occur. By compressing the fibrous lumps from the bottom, where the fluid enters the filter, the filter described in the Masuda et al. patent acts similar to a surface filter (e.g., a septum). In sharp contrast, the apparatus of the invention is a depth filter that removes suspended particles of varying sizes at a uniform rate throughout its depth. The filter of the invention is much less subject to clogging.

15. As material to be filtered passes through the filter bed during the filtration process of the invention, the size distribution of the particulate matter remaining at any point within the filter is reduced. Particles with a decreasing size distribution are effectively removed in the practice of the invention because the average pore size of the compressible filter material also decreases. Pore size distribution decreases from large at the inlet to small at the outlet.

16. Decreasing pore size distribution is in sharp contrast to the Masuda patent, in which pore size does not decrease and larger particles and fines are trapped at the surface of the filter bed. Decreasing the pore size distribution in the direction of fluid flow, which is to say increasing the pore size distribution throughout the filter bed in a direction opposite to that of the fluid flow, maintains removal of particles in dependence on particle size and bed depth, removing smaller and smaller particles with increasing bed density, precluding small particles from clogging the surface of the filter.

17. In further contrast to Masuda, with a moveable compression plate as described in the pending patent application, the pore size of the filter material can be changed during the filtration process in response to filtration performance. Thus, a substantially uniform rate of particle removal can be maintained over the filtration cycle of the filter, as illustrated in Figures B of Figures 8 through 23 of the application. A uniform rate of particle removal over the filtration cycle and adjustable variation in pore size from larger to smaller in the direction of fluid flow over the course of filtration are not achievable in the apparatus of the Masuda patent.

18. The filter of the invention eliminates the structure described in the Masuda patent for moving the lower movable plate, thereby eliminating the ram for the plate that reduces volume in the filter bed, potentially tangles media, channels fluid flow, and can cause sealing problems where the ram passes through the upper stationary perforated plate.

19. That a pore size distribution exists in the filter bed of the invention, which pore size distribution varies from large at the inlet to the filter bed to small at the outlet, was demonstrated in the Ph.D. thesis completed and on file at the University of California at Davis (Caliskaner, 1998) (Exhibit A) and more recently in a report titled *Evaluation of the Filtration*

*Bed Compression Gradient of the Fuzzy Filter; A Compressible Media Filter* (The Resource Consulting Group, 2002) which is attached to this declaration as Exhibit B. As illustrated in the attached reports, the media pore size distribution will vary significantly at the compression ratios normally used for filtration.

20. If the pore size distribution does not decrease in the direction of fluid flow through the filtration media, whether the filter bed is uniformly compressed or is compressed in the wrong direction, as in Masuda, then the rate of suspended particle removal throughout the filter bed will not be uniform and larger particles and fines will tend to accumulate on the surface of the filter, promoting rapid clogging of the filter.

21. Even if it is accepted as true that the porosity is adjustable of the filter disclosed in the Masuda reference, albeit in the wrong direction, it is not true that Masuda discloses all but the direction of porosity adjustment in the pending application. The Masuda reference fails to recognize the establishment of a pore size distribution in the bed and discloses a bed of uniform density. The Masuda filter is incapable in its design of realizing the benefits of adjustable porosity and of varying the pore size throughout the filter depth because the water to be filtered initially encounters the smallest pore size and both large particles and fines are removed at the surface of the filter, clogging the filter.

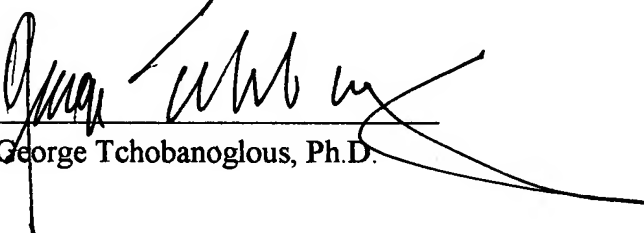
22. The Masuda reference not only fails to recognize the direction of porosity and the establishment of a pore size distribution from large to small in the direction of fluid flow, but the benefits of eliminating apparatus that interfere with filtration efficiency, including a ram that extends through the filter bed and is sealed against the stationary plate at the top of the Masuda bed.

23. The teachings of the Shiltz patent are insufficient to suggest that eliminating interfering apparatus from Masuda and compressing the filter media in the opposite direction could result in the benefits described above. Shiltz is a multi-media filter including compressible and non-compressible components and is therefore not comparable in its operation and effect. There is no indication in Shiltz of the rate of suspended particle removal and whether a removal

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gradient depending on particle size exists at any point in any portion of the filter bed. There is no indication that the filter is compressible to adjust the rate of particle removal during filtration and to retain filtration efficiency over time.

24. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; further, that these statements were made with the knowledge that willful false statements or the like so made are punishable by fine or imprisonment, or both, under 1001 of Title 18 of the United States Code and that such willful false statement may jeopardize the validity of the application or any patent issued thereon.

  
\_\_\_\_\_  
George Tchobanoglous, Ph.D.

12/20/03  
Date

CLT01/4565650v1

# DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

Attorney Docket No. 3753-30A

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled

HIGH RATE FILTRATION SYSTEM,

the specification of which

is attached hereto

[ ] OR

[X] was filed on July 28, 2000, as United States Application No. 09/627,638.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37 Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate, or of any PCT International application having a filing date before that of the application on which priority is claimed.

none			[ ] Yes [ ] No
Number	Country	MM/DD/YYYY Filed	Priority Claimed
			[ ] Yes [ ] No
Number	Country	MM/DD/YYYY Filed	Priority Claimed
			[ ] Yes [ ] No
Number	Country	MM/DD/YYYY Filed	Priority Claimed

## ENGLISH LANGUAGE DECLARATION CONTINUED

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below.

60/032,643	12/10/1996
Application Number(s)	Filing Date (MM/DD/YYYY)
Application Number(s)	Filing Date (MM/DD/YYYY)

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application (37 C.F.R. § 1.63(d)).

08/980,537	December 1, 1997	Abandoned
Appln. Serial No.	Filing Date	Status Patented/Pending/Abandoned
Appln. Serial No.	Filing Date	Status Patented/Pending/Abandoned
Appln. Serial No.	Filing Date	Status Patented/Pending/Abandoned

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.



ENGLISH LANGUAGE DECLARATION CONTINUED

POWER OF ATTORNEY: As a named inventor, I hereby appoint the practitioners associated with the Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and direct that all correspondence be addressed to that Customer Number:

Customer Number 826

Direct correspondence to the  
attention of and telephone calls to:

Christopher M. Humphrey  
Registration No. 43,683

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Full name of (first/sole) inventor: William Frederick Dew, Jr.

Inventor's

Signature: William F. Dew, Jr. Date: 10/3/2000

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